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TAPE RECORDED LECTURES IN THE COLLEGE CLASSROOM--AN EXPERIMENTAL APPRAISAL.

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AN EXPERIMENT WAS CONDUCTED TO TEST THE HYPOTHESIS THAT A GRADUATE-LEVEL COURSE COULD BE TAUGHT EFFECTIVELY WITH A SERIES OF TAPE RECORDED LECTURES. A RESEARCH METHODS CLASS WAS DIVIDED INTO TWO SECTIONS WHICH WERE EQUATED ON THE BASIS OF SCHOLASTIC APTITUDE AS WELL AS SCORES ON TWO DIFFERENT TYPES OF ACHIEVEMENT PRETESTS. THE CONTROL SECTION WAS TAUGHT BY A STANDARD LECTURE-DISCUSSION APPROACH WHILE THE EXPERIMENTAL SECTION WAS TAUGHT PRIMARILY BY A SERIES OF 34 HALF-HOUR TAPED LECTURES. FOR THE TAPE-TAUGHT GROUP, A BRIEF DISCUSSION PERIOD WAS AVAILABLE IN WHICH THE INSTRUCTOR ANSWERED QUESTIONS REGARDING THE TAPED LECTURES. ON THE BASIS OF GROUP PERFORMANCES ON SEVERAL CRITERIA, NO STATISTICALLY SIGNIFICANT DIFFERENCES BETWEEN THE TAPE-TAUGHT AND CONVENTIONALLY-TAUGHT STUDENTS WERE FOUND. IT WAS CONCLUDED THAT TAPED LECTURES, AS EMPLOYED IN THE EXPERIMENT, CAN SERVE AS AN EFFECTIVE TEACHING DEVICE. (HB)

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TAPE RECORDED LECTURES IN THE COLLEGE CLASSROOM

AN EXPERIMENTAL APPRAISAL

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PROBLEM

Faced with the prospect of rapidly increasing college enrollments in the next several decades, educators have been forced to evaluate schemes which can economically yet effectively extend the teaching potential of college faculty personnel. One possible solution to this dilemma is to allow capable instructors to reach more students through the use of mechanical agents such as motion pictures, television, or sound recordings. Although the economy of such a solution is undeniable, the educational effectiveness of certain mass media techniques has not yet been conclusively demonstrated. The experiment* described in the following pages represents an attempt to assess the efficacy of one of these new techniques. The purpose of the investigation was to determine the effectiveness of teaching a graduate level college course with a series of tape recorded lectures.

For the same reasons as film or television instructional approaches, the use of tape recorded lectures could appreciably augment the number of students taught by an instructor. If lectures were pre-recorded and used in several sections of a single course, the professor might devote his time to leading classroom discussions concerning the recorded lectures. Since the lectures might be heard by students in the instructor's absence, this would enable the instructor to take on additional classes. It is possible that an advanced graduate assistant, rather than the regular lecturer, could effectively lead discussions based on the recorded lectures.

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Further, once a series of satisfactory lecture tapes had been prepared, the instructor might subsequently reduce the amount of time required to prepare his lectures, perhaps only occasionally substituting certain recordings or modifying others as new information in his field became available. This increased freedom from lecture preparation duties could obviously be used to good advantage by most professors.

Ultimately, arguments in favor of using tape recorded lectures appear to be most defensible in situations where seriously overcrowded enrollment conditions make it impossible to secure qualified instructors. Faced with a choice between assigning a course to a poorly prepared professor or to a series of recorded lectures prepared by a specialist, many college administrators (and, for that matter, many students) might reasonably be expected to choose the recordings.

Even though it is evident that such a procedure can make it possible for an instructor to reach more students, it must be demonstrated that the approach will yield educational results comparable to those gained through conventional modes of instruction. The present experiment was designed to supply empirical evidence regarding this question.

Previous Research

Among the earliest reported investigations of the educational utility of sound recordings was a series of experiments conducted by Rulon et al. (1943a; 1943b; 1943c; 1944) which dealt with the value of the phonographic recording as a supplementary high school teaching device.

Research concerning the effectiveness of tape recordings in teaching has generally been conducted on the elementary or junior high school

level. Typical of such studies was a series of investigations conducted recently in Nebraska (Pickrel, Neidt, & Gibson, 1958; Gibson, 1959). In these investigations the effectiveness of tape recordings in teaching spelling and conversational Spanish was analyzed. The researchers concluded that the use of tape recordings is a highly effective method at the elementary school level. Successful use of educational tape recordings with elementary and junior high school pupils has also been reported by Gallacher and Ray (1954), Laube and Brentano (1949), and Wendeline (1959).

However, a recent review (Allen, 1960) of research dealing with educational applications of sound recordings indicates that relatively few basic studies have been made of the effectiveness of recordings in teaching factual information. Research dealing with the use of sound recordings at the college level is notably absent.

METHOD

The Variables

The independent variable under consideration in this experiment was method of teaching, i.e., teaching by a conventional lecture-discussion approach versus teaching by a series of tape recorded lectures coupled with brief discussions led in person by the lecturer. The dependent variable was student achievement in a graduate level course in educational research methods. An attempt was made to assess three relatively distinct aspects of student achievement consistent with objectives established for the course.

The Measures

One aspect of student achievement which was considered important in the research methodology course was acquisition of factual information regarding research techniques. In order to assess this content area, an instrument was designed to measure acquisition of such information. This test consisted of 75 multiple choice items covering the essential content of a course in educational research methods.

Another type of student achievement considered important in the course was ability to make sound interpretations from reported research. A test designed to assess ability to draw valid inferences from research information was developed. This test consisted of 25 multiple choice items requiring interpretation, as opposed to information recall.

Since it was also considered desirable for students to develop some degree of competency in planning research studies of their own, a method was devised to assess ability to design a research study. Students were given a brief description of a problem suitable for research analysis and were instructed to describe a research plan appropriate for investigating the problem. The written descriptions were rated by two faculty members (other than the writer), both of whom are experienced research workers.

Since intellectual capacity was considered an important variable upon which groups should be equated, scholastic aptitude was assessed by the Miller Analogies Test [1] (MAT), an instrument devised to measure academic aptitude at the graduate school level. The MAT consists of 100

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[1] Miller Analogies Test, The Psychological Corporation, New York, 1952.

verbal analogies of the standard form, A : B::C : D. Each test item requires a recognition of the relationship between elements in the analogy.

Research Sample

Subjects for the experiment were 55 students enrolled during the 1960 summer session in an educational research methods course at Kansas State College of Pittsburg. This course is an institutional requirement in the sequence leading to the Master of Science degree. The writer served as the instructor in the course.

Procedure

During the first regular class meeting of the summer session, students enrolled in the educational research methods class were informed that they would be involved in a research investigation dealing with the effectiveness of tape recorded lectures as a teaching technique. The first two class periods were utilized for the administration of the following instruments: the information test (40 minutes), the interpretation test (25 minutes), and the research design (25 minutes).

In addition, another class period was devoted to the administration of the MAT to all subjects who had not previously taken the examination. Information was also gathered from each student regarding sex, age, amount of graduate credit, amount of teaching experience, and previous credit in courses related to research methods, i.e., statistics or measurements.

On the basis of the test scores and other information obtained during the first three class sessions, students were assigned to two groups which

were matched in terms of MAT scores, pre-test information scores, and pre-test interpretation scores. There were no significant differences between the groups with respect to sex, age, graduate credit, teaching experience, or previous credit in measurements or statistics. One of the two groups was randomly designated as the experimental section (to be taught via tape recordings) and the other was designated as the control section (to be taught in a conventional mode). The experimental and control sections included 27 and 28 sections respectively. Means and standard deviations of the two sections for the three matching variables are presented in Table 1.

Table 1

Means and standard deviations of the experimental and control groups on the Miller Analogies Test, the information pre-test and the interpretation pre-test

Group	N	MAT		Information		Interpretation	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
Experimental	27	33.9	12.5	10.4	4.2	5.0	3.1
Control	28	33.9	12.5	10.5	4.7	5.0	2.6

Both groups attended class each afternoon, Monday through Friday. The control section commenced at 2:10 and lasted until 3:00. The experimental section began at 2:30 and ended at 3:20. Since the first 30 minutes of the experimental class consisted of a tape recorded lecture, the instructor was able to meet with the control class and, at its conclusion, meet with the experimental class for a 20 minute period which was used for discussion purposes. A research assistant, enrolled for credit but

not included as a subject in the experiment, operated the tape recorder for the experimental class.

Lectures for the experimental class were usually taped several days in advance (rarely more than three) in order that the sequence of course content would be comparable in both experimental and control sections. Each tape lasted approximately 30 minutes. In all, 34 taped lectures were heard by the experimental class. These lectures covered the basic content of the course in research methodology.

The same material that formed the substance of the taped lectures was treated in the control class, but in a lecture-discussion manner. In the experimental class, the discussion following the taped lectures was usually based upon the content of that particular day's lecture. Questions which students had written out during the recorded lecture were frequently addressed to the instructor during the discussion period.

At the conclusion of the summer session, two days were devoted to testing. During these class sessions the experimental and control groups met together in one room. The same tests which were used at the outset of the experiment were re-administered, i.e., the information test (55 minutes), the interpretation test (25 minutes), and the research design test[2] (30 minutes).

Opinions of the tape recorded lecture technique were solicited from experimental students during the last week of the summer session. In order to promote candor, unsigned written opinions were to be handed in to a student (chosen by the class) who was to give them to the instructor

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[2]Although the general format was the same as the pre-test, a different problem was used for the post-test version of this instrument.

after the deadline for filing course grades.

Analysis

Since the two groups had been equated on variables which were considered to be positively related to the criterion measures, differences between groups were tested by a t test model appropriate for use with equated groups[3] (The equating measure used in these analyses was a student's score on the MAT.) Pearson product-moment correlation coefficients were computed between the measures involved in these t tests. In testing for differences between the two groups on the experts' evaluation of students' proposed research plans the Mann-Whitney U Test[4] was employed. The Mann-Whitney test was also used to test differences between performance of high ability experimental and control students as well as differences between low ability experimental and control students. Opinions of the experimental students regarding the tape recording method were summarized.

RESULTS

As the first step in the data analysis, correlation coefficients were calculated for the following relationships: MAT--information post-test, MAT--interpretation post-test, information post-test--interpretation post-test, and MAT--information post-test and interpretation post-test combined. The correlation coefficients for these four relationships are presented in Table 2.

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[3]This technique is treated by Edwards (1957), pp. 282-288.

[4]This test is described by Siegel (1956), pp. 116-127.

Table 2

Intercorrelations of 55 students' scores on the Miller Analogies Test, information, interpretation, and combined information and interpretation post-tests

Measures	r
MAT--Information	.46
MAT--Interpretation	.46
Information--Interpretation	.41
MAT--Combined information and interpretation	.51

All of the correlation coefficients were statistically significant beyond the .01 level. Identical coefficients of .46 were observed between the MAT and the information test as well as between the MAT and the interpretation test. Because of these significant relationships, it was considered appropriate to use MAT scores as a matching variable in the particular t model which was to be employed for testing differences between groups.

The correlation of .41 between the information and interpretation tests, although statistically significant, tends to indicate that these two instruments which were developed for the present experiment assessed characteristics which (though related) were somewhat different in nature, ostensibly information acquisition and interpretation ability. In order to provide a more comprehensive index of performance, each student's scores on the two tests were combined by simple addition. The relationship between the MAT and the combined information and interpretation tests was slightly higher than the other three, i.e., r=.51.

Differences were tested between performances of the experimental and control groups on the information post-test, the interpretation post-test, and the combined information plus interpretation tests by a t model in which MAT scores were employed as a matching variable. Standard deviations, means, and t values for these analyses are presented in Table 3.

Table 3

Means, standard deviations, and t values of experimental and control groups' post-test performance on the information, interpretation, and combined information and interpretation tests

Test	Group				
	Experimental			Control	
	S.D.	Mean	t	Mean	S.D.
Information	8.99	49.41	1.31	51.86	6.35
Interpretation	3.59	17.00	.20	17.18	3.56
Combined	11.45	66.41	1.12	69.04	8.24

No significant differences between the two groups were discerned on any of the three measures. The performance of the control group tended to be slightly superior to that of the experimental group. The performance of the two groups was similar in the case of scores on the interpretation test where a mean difference of only .18 was observed. The differences between mean scores of the two groups on the information test was 2.45. The difference between group means for the combined tests was 2.63.

In order to test the hypothesis that students of dissimilar intellectual ability respond differentially to the taped lectures, both the experimental and the control classes were divided into sub-groups. In each case, a high

ability group was composed of those students who scored above the group MAT mean and a low ability group was composed of those who scored below the group MAT mean. In both the experimental and control sections the upper ability sub-group was composed of 12 students. In the experimental and control sections the low ability sub-group consisted of 15 and 16 subjects respectively. Differences were assessed by the Mann-Whitney U Test.

No significant differences were observed between the experimental and the control groups either in the case of the high ability or low ability sub-groups. The high ability experimental group did perform proportionately better (but not significantly so) in relation to the control group than did the experimental group as a whole. In fact, the high ability experimental students slightly out-performed their control counterparts on the information test and combined information plus interpretation tests. On the other hand, the low ability control students tended to widen the gap in performance between themselves and the low ability experimental students.

Students' written responses to the research design test were rated by two experienced researchers. In order to eliminate bias arising from the raters' previous acquaintance with some of the students in the study, names were removed from the responses and identification was made with a code number system. It was impossible for the raters to determine whether the responses were made by experimental or control students. Although the raters conferred prior to the rating process in order to agree upon the criteria to be employed in a ranking scheme, each rater evaluated the papers individually. Pre- and post-test responses were rated separately.

The degree of inter-rater agreement was determined by rank order correlation coefficients for ratings of the pre-experiment designs as well as the post-experiment designs. For the pre-test, the coefficient between raters' evaluations was .86. For the post-test, the coefficient was .67. Both of the rank order coefficients were significant beyond the .01 level.

Differences between the quality of research plans prepared by the experimental and control groups were tested for significance by the Mann-Whitney U Test. The difference between ratings of the two groups was not statistically significant on either the pre-experiment responses, (z=1.17) or the post-experiment responses(z=.19).

In general, student opinions of the taped lecture method were favorable. Among the advantages which students noted for the experimental approach were (1) that there were fewer distractions and interruptions during the course of a taped lecture than in an ordinary classroom lecture, (2) that the recorded lectures were better organized than in a typical class, and (3) that the relaxed atmosphere produced by the teacher's absence was conducive to learning. On the negative side, several students pointed out (1) that the taped lectures occasionally moved too rapidly and (2) that questions which might have been asked during the course of the lecture were sometimes forgotten prior to the discussion period.

Many of the students in the experimental group indicated that the discussion period following the taped lectures was extremely important since it allowed an opportunity for clarification of lecture material.

DISCUSSION

Since the performance of the tape-taught students was comparable to that of the conventionally taught students on all of the criterion measures considered, it must be concluded that tape recorded lectures, as they were employed in this experiment, can be used effectively as a teaching technique.

This interpretation, however, must be made within the framework of the present investigation which can be appropriately classified as a pilot study. The results do suggest that further research on a larger scale may demonstrate that tape recorded lectures at the college level can effectively be used to widen a faculty's teaching capacity. It is possible, however, that only certain types of course content are amenable to this approach.

The extent to which the discussion periods led by the instructor are necessary for clarification purposes must be determined by other investigations. Many students in the tape-taught section expressed the belief that the tapes would have been less effective without these discussions.

Other research may reveal that the tape recording approach is optimally beneficial with students of above average intellectual ability. A non-significant but discernable tendency in that direction was observed in the present study.

The writer's personal reaction to the taped lecture approach may be of interest to those who might consider employing this method. With respect to the preparation of taped lectures, several points should be noted. First, it became obvious that the preparation of professional quality recordings is an inordinately time consuming task. Since students have become conditioned to the excellent quality of radio and television

broadcasting, educational recordings of high technical quality are most desirable. If financially feasible, professional editing of tapes would appear to be advantageous. Second, it is often difficult for a lecturer to generate the same degree of verbal enthusiasm and interest when speaking to a microphone instead of a class of students. Finally, the lecturer soon becomes aware of the excellent opportunities for organization of content and selection of appropriate phrases which are available with the taped lecture approach. By temporarily halting the recorder one is provided with time to systematize ideas and determine suitable expressions. In a typical classroom, the only extended pause at the instructor's disposal is signalled by the end-of-class bell.

SUMMARY

An experiment was conducted during the 1960 summer session at Kansas State College of Pittsburg to test the hypothesis that a graduate level course could be taught effectively with a series of tape recorded lectures. A research methods class was divided into two sections which were equated on the basis of scholastic aptitude as well as scores on two different types of achievement pre-tests. The control section was taught by a standard lecture-discussion approach while the experimental section was taught primarily by a series of 34 half-hour taped lectures. For the tape-taught group, a brief discussion period was available in which the instructor (in person) answered questions regarding the taped lectures. On the basis of group performances on several criterion measures, no statistically significant differences between the tape-taught and conventionally-taught students were found. It was concluded that taped lectures, as employed in the experiment, can serve as an effective teaching device.

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